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## AFOSR-TR- 88-1318

# Final Technical Report to the Air Force Office of Scientific Research

Grant No. AFOSR-87-0104

January 1988 - August 1988

# HEAT AND HYDROLYTICALLY STABLE POLYMERS FOR FABRICABLE FILMS AND LAMINATES

DT BOPY INSPECTED

C. S. Marvel H. K. Hall, Jr.

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Chemistry Department
University of Arizona
Tucson, AZ 85721

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#### Results

Pyromellitic dianhydride 1 is a well-known component of polymers with excellent heat and oxidative stability such as Kapton<sup>R</sup>. p-Benzoquinone dianhydride 2 might be equally good. Brief literature reports already describe its roundabout synthesis (1) and its incorporation into polyimides (2). We have tried to devise a synthesis route which would make this interesting monomer readily available.

1

Various attempts to improve the base-induced coupling of acetonedicarboxylic ester by iodine (1,3) failed to give more than traces of the desired tetraester:

3

2

Coupling attempts using the dibromo derivative of acetonedicarboxylic ester also failed.

Next, Claisen self-condensation of tetraethyl 1,1,2,2-ethanetetracarboxylate was found to give very low yields of the tetrahydro derivative corresponding to 3.

In the final phase of our work, the readily available 4 was converted to three derivatives 5-7 by reaction with alkali or thallium salts:

These were considered as possible intermediates for new thermally stable polymers.

Yields were low, probably because of the unusual chemistry of these electrophilic quinones, as known for tetracyano-p-benzoquinone (4) and also because the aqueous work-up of the synthesis led to the dihydroxy quinone dicarboxylate (5).

This area does not seem promising for practical syntheses of thermally stable polymers.

#### References

- 1. P. R. Hammond, <u>J. Chem. Soc</u>. 1521-1523, 1971.
- Heinrich Deibig, Lukas Helmut, Michael Plachky, Germany Patent 2,005,211 (1972).
- 3. Marye Anne Fox, Chia-Chung Chen, J.C.S. Chem. Commun., 23-24, 67, 1985.
- Kurt Wallenfels, G. Bachmann, D. Hofmann, R. Kern, <u>Tetrahedron</u>, 2239-2256, <u>21</u>, 1965.
- 5. M. Tomida and H. K. Hall, Jr., <u>J. Org. Chem</u>. (submitted).

### <u>Personnel</u>

- H. K. Hall, Jr.
- A. B. Padias
- M. Tomida

#### Publications under this grant.

"Three New Electrophilic Quinones," M. Tomida and H. K. Hall, Jr., submitted to J. Org. Chem.